Method for Calculating Restricted Distance for a Research Rig

1. Determine the total system volume.

Given the Maximum Allowable Working Pressure for the system:

$$MAWP = 240 \cdot \frac{lb}{in^2}$$

Given a 100 • cc sample cylinder:

$$V_{cyl} = 100 \cdot cm^3 \qquad or \qquad V_{cyl} = 3.531 \cdot 10^{-3} \cdot ft^3$$

Given system tubing that is 0.25 inch O.D., with an 0.035 inch wall. The cross-sectional area of the tube is:

$$A_{tube} = \frac{\cdot (0.25 \cdot in \tilde{n}\ 2 \cdot 0.035 \cdot in)^2}{4} \qquad A_{tube} = 0.0254 \cdot in^2 = 1.767 \cdot 10^{-4} \cdot ft^2$$

Given a conservative estimate that there is 20 feet of tubing in the system. The volume of the tubing is:

$$V_{tube} = 20 \cdot ft \cdot A_{tube} \qquad V_{tube} = 3.534 \cdot 10^{-3} \cdot ft^3$$

Therefore, the total system volume is:

$$V_{total} = V_{cyl} + V_{tube} \qquad V_{total} = 7.065 \cdot 10^{-3} \cdot ft^3$$

2. Determine the restricted distance, given the test pressure and total system volume.

The test pressure to be applied to the system:

$$P_{test} = 1.25 \cdot MAWP \qquad P_{test} = 300 \cdot \frac{lb}{in^2}$$

From the figure on the following page, the restricted distance for a $1000 \cdot ft^3$ system with $P_{test} = 300 \cdot \frac{lb}{in^2}$ is:

$$D_{1000} = 225 \cdot ft$$

The correction formula to obtain the restricted distance for the actual system volume is:

$$D_{system} = \frac{D_{1000} \cdot \sqrt[3]{V_{total}}}{10 \cdot ft}$$

Therefore, the restricted distance for the pressure test is:

$$D_{system} = 4.3 \cdot ft$$

July 2002
NASA Glenn Research Center

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